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A NEW DATA RESOURCE FOR NAUTICAL CARTOGRAPHY: THE AUTOMATED NOT--ETC(U)
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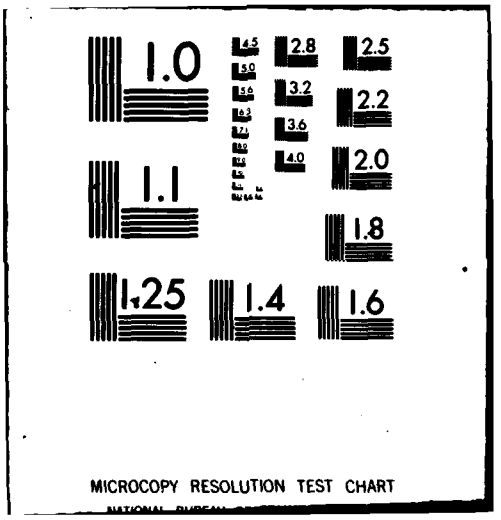
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Summary of Corrections
nautical cartography
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Automated Notice to Mariners System (ANMS) is a new ~~automated~~ system for the computerized typesetting of the Weekly Notice to Mariners and periodic Summary of Corrections publications. The Chart Corrections Sections of these two publications are the largest and most important sections; therefore, they were selected as the first subsystem of the ANMS. Hardware and software necessary to support the Chart Corrections Subsystem are presently installed at the Defense Mapping Agency Hydrographic/Topographic Center (HTC). A digital data base of

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20. ABSTRACT (continued)

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A NEW DATA RESOURCE FOR NAUTICAL CARTOGRAPHY
THE AUTOMATED NOTICE TO MARINERS

by

MORRIS F. GLENN
NAVIGATION DEPT.
DEFENSE MAPPING AGENCY
HYDROGRAPHIC/TOPOGRAPHIC CENTER
WASHINGTON, D.C. 20315

ABSTRACT

The Automated Notice to Mariners System (ANMS) is a new ~~automated~~ system for the computerized typesetting of the Weekly Notice to Mariners and periodic Summary of Corrections publications. The Chart Corrections Sections of these two publications are the largest and most important sections; therefore, they were selected as the first subsystem of the ANMS. Hardware and software necessary to support the Chart Corrections Subsystem are presently installed at the Defense Mapping Agency Hydrographic/Topographic Center (HTC). A digital data base of all up-to-date chart corrections information is nearing completion. In addition to supporting computerized publication requirements, the data base has multiple uses and benefits. It can be queried from anywhere in the world via modern communications equipment on a 24-hour basis, and a variety of computer programs are available to extract, manipulate, and format data from the ANMS data base. This paper introduces the ANMS and describes its utility as a new data resource for nautical cartography.

INTRODUCTION

The Automated Notice to Mariners System (ANMS) is a combination of commercially available hardware and specially designed software. It is a new system designed to produce publications of importance to the maritime community and to offer users new capabilities which have never before been possible.

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The ANMS is made up of over 45 individual computer programs, some of which are described in the following paragraphs. The primary output of the ANMS will be page negatives for printing the Notice to Mariners, new Summary of Corrections, List of Lights and eventually Sailing Directions. As an added benefit, the software for the ANMS was developed with query capabilities available to the entire maritime community. Not only will the printed publication be available sooner to the mariners in-port but at sea, navigation information will also be accessible with commercially available communications equipment.

The data base is a major source of maintenance information for nautical charts. Provision has been made in the Chart Corrections Software to assign and total correction points which are based upon the relative difficulty that each individual chart correction represents. The total is then carried in the Summary of Corrections data base and can be displayed at any time on the data output screen, or it can be output as a separate management report. Of special significance is the fact that these data can be used to indicate the need for chart revision and other management considerations. Other in-house data files such as the "Unconfirmed File" might indicate the need for actual field survey observations to be made.

In discussing the benefits to nautical cartography, it should not be overlooked that the predominent use of the ANMS is to support the mariner. Users will be numerous military ships and a wide variety of merchant vessels. As the size and speed of ships have increased, conversely the size of the crews and the time that can be devoted to the important task of correcting charts and publications abcard ship have decreased Recognizing this turn of events, some charting agencies provide supplemental material with their Notice to Mariners to alleviate the chart correction task for the navigator.

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Such additional material is helpful, but it increases the production workload. When the ANMS is fully operational, the latest chart correction data will be available to Mariners before they enter port or sail their ships into shallow or otherwise dangerous areas. As a separate development effort, Navigational Broadcast Warnings will be made a part of the ANMS data base.

NOTICE TO MARINERS AUTOMATION PLAN

Inspection of the weekly Notice to Mariners shows that there are many formats incorporated into it as follows:

Section I

(a) Chart Corrections.
(b) Coast Pilots/Sailing Directions Corrections.
(c) Catalog Corrections - New Charts and Publications.
(d) Chartlets/Depth Tabulations/Notes.

Section II

(a) Light List Corrections.
(b) Radio Navigational Aids Corrections.
(c) Other Publication Corrections.

Section III

(a) Broadcast Warnings.
(b) Marine Information - Miscellaneous.

Material from here to p. 8 was based upon Material previously cleared for publication

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The chart corrections section is the area in which the greatest savings could be derived from automation; therefore, it was the first software effort planned for the new system. A phased development of the Notice to Mariners System began in 1975. Phase One, Chart Corrections, is presently nearing completion. The phased approach to the development of the automation plan was selected to provide the earliest initial capability to use the hardware and begin realization of manpower and time savings. Also, Chart Corrections are data that will accumulate over a multiyear period and a fully operational data base for this product will not be reached until 1984. Data will be input at a rate of 6 megabytes (mb) per year for a total of 26 mb for a mature data base that will be used to produce the Summary of Corrections, which is now produced manually.

Phase Two of the ANMS will add the capability to print the List of Lights corrections and Radio Navigational Aids corrections published in the Notice to Mariners. Since the software for this phase of the corrections is designed to also support the annual publications, the complete List of Lights and Radio Navigational Aids will be produced on the ANMS as well as the Notice to Mariners.

Phase Three includes the Sailing Directions corrections, Navigational Warnings, and Catalog corrections. At this point in the development of the ANMS, the complete automation of these publications is only in the planning stage.

The ANMS will provide a total navigational publications system with very flexible text editing capabilities, instant hard copy generation of paged text from the data base, and rapid generation of page negatives for printing. With such powerful publications management capability, once the initial publication is loaded into the data base, changes and new editions will be almost automatic.

Phase Two software will utilize the same hardware configuration which has been installed for the Chart Corrections Subsystem. The software will operate under the same controller, and subsystem architecture will be much the same as that written for the Chart Corrections Subsystem. The software for the Imlac PDS-- data input stations was written in modules, which can be easily changed to modify the screen format for other future DMA publications. Therefore, such publications as the List of Lights (Phase Two) will build upon the initial software and require less development of new software.

ANMS COMPUTER SYSTEM

ANMS hardware is a combination of three commercially available systems: Prime 400 computer and peripherals; Imlac PDS-4 intelligent terminals; and the Photon Pacesetter Mark III. This configuration forms a unique combination when used as a publication system and, as a result, required the development of all new software. The heart of the ANMS system is the Prime 400 mini-

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computer introduced in March 1976. It was the first minicomputer to use both demand paging and segmentation technology to manage its virtual memory system. The Prime 400 supports up to 63 simultaneous, interactive, time-shared users and provides each user with up to 32 mb of virtual address space. The Prime 400 installed at DMAHTC has 512K bytes of MOS main memory, and it provides the ANMS with high-speed computational capability. The operating system, called PRIMOS IV, supports both interactive and batch processing. The Prime 400 possesses two drives with capability to control two more disk units for an additional total of 900 mb. The system also has two nine-track tape drives, one Centronics printer, two Terminet 30 terminals, one Omron terminal, and four modems.

DATA INPUT STATION HARDWARE

The basic input/work station for the ANMS is the IMLAC PDS-4 "Interactive Graphic Computer Display System". There are two of these work stations on line for the ANMS. Each PDS-4 is configured as follows:

Display monitor CRT
Alphanumeric Keyboard
Two floppy disk units
Programmer/Maintenance Control Panel and
Versatec Printer Plotter

Under program control the alphanumeric keyboard can incorporate any number of functions without hardware modification. There are 67 keys including 6 user-definable function keys. Both PDS-4s are connected to the Prime 400 by a 9600-baud line. Input of data to the Prime 400 will be interactive. There will be an option to load in a batch mode in case the computer fails. The Imlac has a memory size of 32K bytes and the two floppy disks can store up to 256K bytes of data.

The terminals are programmed to prompt the operator for the structured input of navigational data. Each terminal is an interactive design that, once initiated, asks for data, checks the data and, if correct, proceeds to the next input. The programming for this part of Phase One is probably the most critical of the system development. The IMLAC PDS-4 is the human interface with the system and present plans call for extensive "human engineering" to optimize the motions and procedures which the operator will use to input data. The user-defined keys on the keyboard will incorporate the more complex and tedious operator input steps. Present plans call for the input station operator to require minimal professional skills. Personnel with background training on keyboard entry equipment can easily be assigned on an hourly basis for this function. This allows great flexibility for DMA management for data base construction.

ANMS SOFTWARE

The ANMS software is a unique system and the DMAHTC programming is essentially a first-time, research and development effort. The present system architecture has been designed around the following functional areas:

Weekly Production

Weekly Workfile Data Entry and Update
Print Cycle
Weekly Workfile Query Programs
- Chart and line number
- All records
- Non-DMAHTC records
- Editors extract
- New charts and editions
- Canceled charts and editions
- Temp/prelim corrections

Summary Production

Summary Query Jobs
- Charts affected by Notice Nos. (Public use)
- Effective temp/prelim corrections (Public use)
- Effective and temp/prelim corrections with text (Public use)
- Region and chart (Public use)
- Chart Number (Public use)
- Between Notice Nos. (Public use)
- Chart from Notice (Public use)
- (Public Use Programs are those ANMS programs which will be open for the general public to use)

History File on Chart Number

Since the Notice to Mariners is a weekly publication, when the due date for the publication is reached, the print cycle begins on the computer. A Photon tape produces a high-quality negative by use of the Photon Pacesetter Mark III. Also, at that point, there is a History File Update and a Summary File Update for the ANMS data base. The Summary File forms the data base for subsequent navigation publications and for public use. As a benefit to mariners in general, the ANMS is equipped with query programs. These programs output navigation information in a variety of formats that will provide the remote user with a rapid chart correction capability. In order to optimize use of long-distance communications, chart corrections may be ascertained from the last printed Notice available on board the ship, and the navigator may query the data base for later corrections. If several Notices are missing, the navigator can query corrections between specific Notice numbers or the data base may be queried for all the effective Notices pertaining to a chart(s). User instructions will be published by DMAHTC to enable maritime users to make the most effective use of expensive communications time.

COMMUNICATIONS INTERFACE

New commercial global communication systems such as MARISAT can provide instant links to the DMAHTC data base from anywhere in the world. At present, this link requires the user to have a small inexpensive data terminal with acoustic coupler attached. There are four commerical data lines installed at DMAHTC. The user dials in over one of these voice-grade, 300-baud lines and, as mentioned earlier, there are seven public-use options to query the available DMAHTC data base. At sea, users could use one of the voice-grade channels of the MARISAT system. The "land-line" communications link is the less expensive alternative. This could be used from any port in the world and allow the ship's navigator to correct charts. Further, it would be of great use to cover unplanned changes to his schedule or to ascertain the very latest navigation information. It is too early at this point to predict the number of "at-sea" and remote "in-port" users of this system. It is a new and revolutionary capability, and factors, such as reduction of insurance rates and burden of proof in marine accidents, could greatly affect its usage. (The speaker will demonstrate the query capability of the ANMS by using a portable terminal and obtaining information from the data base in Washington, D.C.).

THE ANMS AS A DATA RESOURCE FOR NAUTICAL CARTOGRAPHY

Probably the most important contribution that the ANMS will make to nautical cartography is the capability to query for new chart corrections at any stage of chart production. During normal chart compilation procedures, the chart corrections will be requested at the beginning of the task. The capability to query the data base for any new corrections which were recorded during compilation will be an important new benefit for cartographers.

The management capability provided by the correction point program is also important. Reports generated on the ANMS can be circulated to all offices concerned with chart revision and compilation to document the number of correction points and number of corrections against each chart in the data base. This information can be used to drive the compilation process by either speeding up or otherwise changing chart recompilation schedules.

Survey ships, both commercial and government, are also expected to be frequent users of the system because they are generally equipped with the most up-to-date equipment and require the best possible navigation and chart information. They could also utilize modern satellite communications to send and receive messages via the ANMS mailbox software. The potential for two-way communication with ships at sea utilizing the ANMS data base and associated software has obvious advantages.

ANMS SOFTWARE AVAILABLE TO THE CARTOGRAPHER

In addition to the programs noted under the Section "ANMS Software", there are various other programs which will be useful to the cartographer. Probably the most important is the query program to request all chart corrections within a specified geographic area. This eliminates the need to make a query for corrections to the individual charts that exist within the area of interest. If these same data were requested by specific chart numbers, there would be a large volume of data returned that fall outside of the area of interest. This program is called "QS-30" within the ANMS. During the early stages of chart compilation this geographic query capability will be an important new data resource for nautical cartography.

As the chart nears completion, the cartographer will probably execute Chart Query "QS-06" for all corrections pertaining to a particular chart to insure that the chart reflects the very latest correction information. It should also be noted in the section entitled "ANMS Software" that segments of the data base may be queried and corrections between notices or from a notice (to date) can be queried. This is especially important if the cartographer is at a remote office, ship, or site where long distance communications must be used.

CONCLUDING REMARKS

The ANMS data base and use of modern communication equipment makes chart correction information available to potential users on a near real-time basis. The mariner at sea is the largest potential benificiary of this capability; but, the data base offers all nautical cartographers a valuable data resource. It is expected that use of the remote query capability will improve the safety of navigation in all of its various phases. From the compilation of safer charts to the notification of a navigator of the latest chart corrections and broadcast warnings, the ANMS will improve safety of life and property at sea. The Chart Corrections Subsystem is merely the first Phase of the ANMS, and other automation efforts will expand DMA's service to the maritime community.

ACKNOWLEDGEMENT

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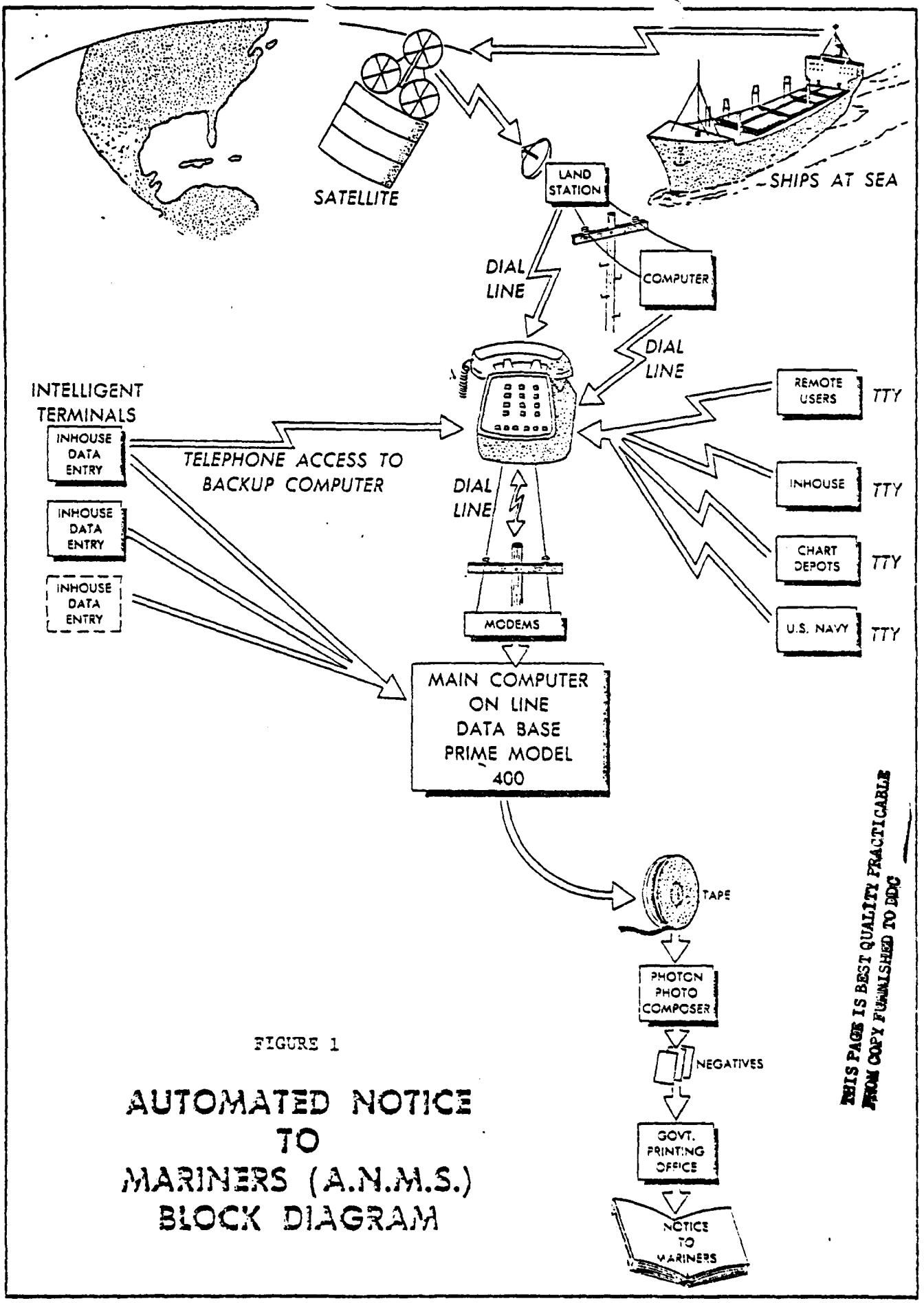

FIGURE 1

AUTOMATED NOTICE TO MARINERS (A.N.M.S.) BLOCK DIAGRAM

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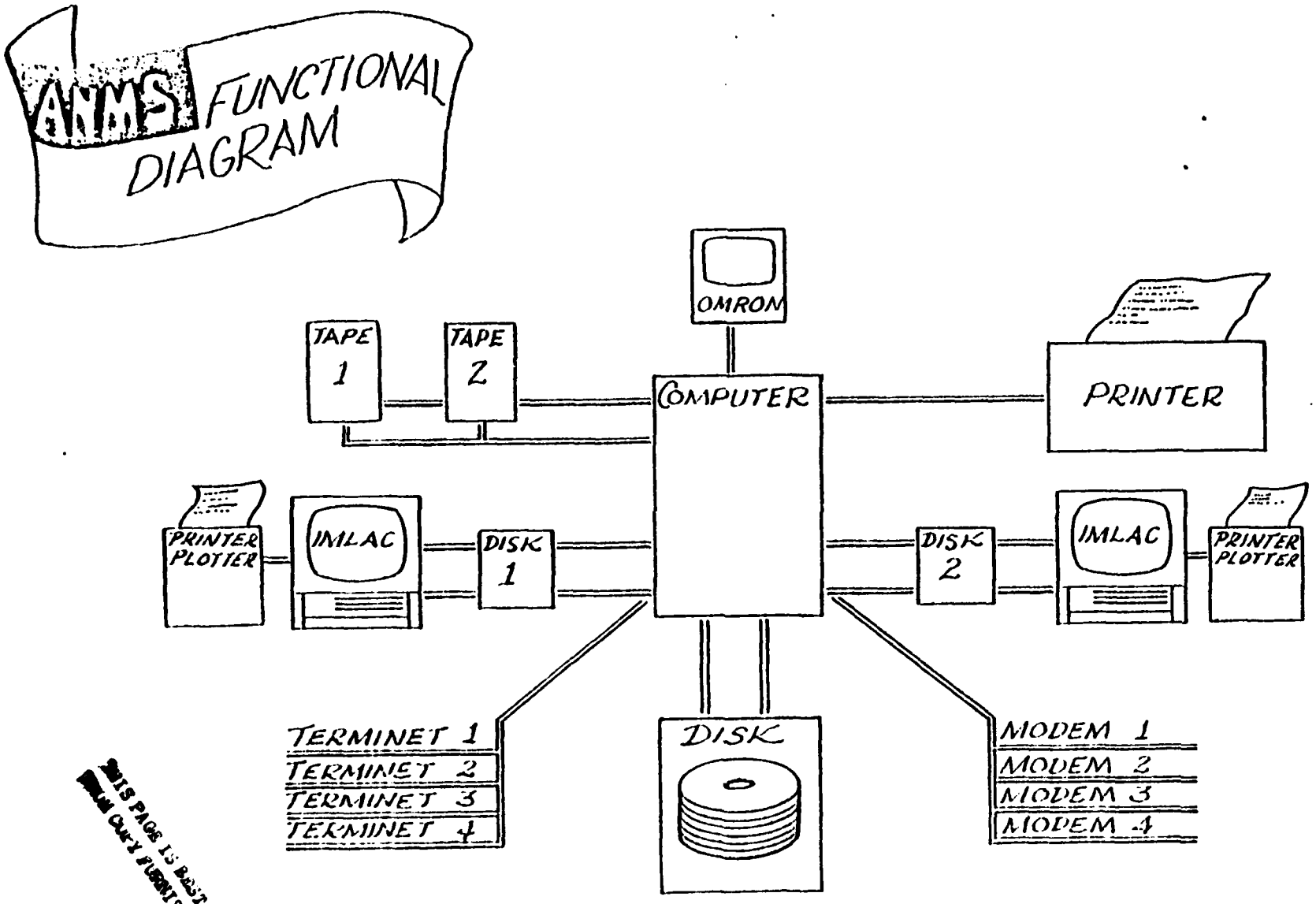

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